## Climate Change and Human Health Literature Portal



# Model variations in predicting incidence of Plasmodium falciparum malaria using 1998-2007 morbidity and meteorological data from south Ethiopia

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#### Abstract:

BACKGROUND: Malaria transmission is complex and is believed to be associated with local climate changes. However, simple attempts to extrapolate malaria incidence rates from averaged regional meteorological conditions have proven unsuccessful. Therefore, the objective of this study was to determine if variations in specific meteorological factors are able to consistently predict P. falciparum malaria incidence at different locations in south Ethiopia. METHODS: Retrospective data from 42 locations were collected including P. falciparum malaria incidence for the period of 1998-2007 and meteorological variables such as monthly rainfall (all locations), temperature (17 locations), and relative humidity (three locations). Thirty-five data sets qualified for the analysis. Ljung-Box Q statistics was used for model diagnosis, and R squared or stationary R squared was taken as goodness of fit measure. Time series modelling was carried out using Transfer Function (TF) models and univariate auto-regressive integrated moving average (ARIMA) when there was no significant predictor meteorological variable. RESULTS: Of 35 models, five were discarded because of the significant value of Ljung-Box Q statistics. Past P. falciparum malaria incidence alone (17 locations) or when coupled with meteorological variables (four locations) was able to predict P. falciparum malaria incidence within statistical significance. All seasonal AIRMA orders were from locations at altitudes above 1742 m. Monthly rainfall, minimum and maximum temperature was able to predict incidence at four, five and two locations, respectively. In contrast, relative humidity was not able to predict P. falciparum malaria incidence. The R squared values for the models ranged from 16% to 97%, with the exception of one model which had a negative value. Models with seasonal ARIMA orders were found to perform better. However, the models for predicting P. falciparum malaria incidence varied from location to location, and among lagged effects, data transformation forms, ARIMA and TF orders. CONCLUSIONS: This study describes P. falciparum malaria incidence models linked with meteorological data. Variability in the models was principally attributed to regional differences, and a single model was not found that fits all locations. Past P. falciparum malaria incidence appeared to be a superior predictor than meteorology. Future efforts in malaria modelling may benefit from inclusion of non-meteorological factors.

Source: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2898788

#### **Resource Description**

#### Early Warning System: M

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

### Climate Change and Human Health Literature Portal

Exposure: M

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Meteorological Factors, Precipitation, Temperature

**Temperature:** Fluctuations

Geographic Feature: M

resource focuses on specific type of geography

None or Unspecified

Geographic Location: M

resource focuses on specific location

Non-United States

Non-United States: Africa

African Region/Country: African Country

Other African Country: ethiopia

Health Impact: M

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Mosquito-borne Disease

Mosquito-borne Disease: Malaria

Mitigation/Adaptation: **☑** 

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: ™

type of model used or methodology development is a focus of resource

**Outcome Change Prediction** 

Resource Type: M

format or standard characteristic of resource

Research Article

Timescale: M

time period studied

Short-Term (

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# Vulnerability/Impact Assessment: №

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system A focus of content